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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,505	06/23/2003	Chih C. Lin	024-34393CIP	9707

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EXAMINER

COLLINS, GIOVANNA M

ART UNIT

PAPER NUMBER

3672

DATE MAILED: 11/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/601,505

Applicant(s)

LIN ET AL.

Examiner

Giovanna M. Collins

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-4, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott (6,062,070) in view of Griffin (6592985).

Scott discloses (see Figs. 2-4) an earth-boring bit, comprising a bit body (12); a cantilevered bearing pin (30) depending from the bit body; a cone (3) mounted for rotation on the bearing pin, and a bearing surface (at 7a, 7b and 6a, 6b) that is a steel alloy between the cone (34). Scott discloses a diamond coating (48,46) between the pin and cone but does not disclose the coating is a diamond like coating. Griffin teaches diamond and diamond like coatings are art recognized equivalents (see col. 3, lines 56-60). Inasmuch as the references disclose these elements as art recognized equivalents, it would have been obvious to one of ordinary skill in the exercise art to substitute one for the other. In re Fout, 675 F.2d 297, 301, 213 USPQ 532, 536 (CCPA 1982).

Therefore, it would be obvious to one of ordinary skill in the art to modify the bit disclosed by Scott to use a diamond like coating as the hard surface coating as taught by Griffin because diamond or diamond like coatings are art recognized equivalents.

Referring to claims 2-4, Scott does not specifically disclosed the thickness of the coating. However, it has been held that where the general conditions of a claim are

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disclosed in the prior art discovering the optimum range or workable ranges involves only routine skill in the art. In re Killing, 895 F.2d 1147, 14 USPQ2d 1056. As it would be advantageous to have the thickness that gives the best wear resistance it would be obvious to one of ordinary skill in the art at the time of the invention to further modify the bit disclosed by Scott to coating with the disclosed thickness.

Referring to claim 12, Scott discloses a coating is form on a journal surface of the bearing pin (see fig. 3).

Referring to claim 13, Scott discloses a coating is deposited within a cavity of a cone (see fig. 4).

2. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott (6,062,070) in view of Griffin (6592985) as applied to claim 1 and further in view of Handbook of Carbon, Graphite, Diamond and Fullerenes, by Pierson.

Scott, as modified, discloses the bit of claim 1 but does not specifically discloses the diamond like coating has a Knoop Scale Hardness in the range from 2000-5000. Pierson teaches that one property of diamond like coatings is that they have a Knoop Scale Hardness in the range of 2000-5000 (see table 14.2). As one of ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to modify the bit disclosed by Scott to have a Knoop Scale Hardness in the range of 2000-5000 as taught by Pierson.

Referring to claims 6, Scott, as modified, discloses the bit of claim 1 but does not specifically disclose the diamond like coating is of carbon with a mixture of sp^3 and sp^2 bonds between atoms of the carbon. Pierson teaches that one property of diamond like coatings is that they are carbon with a mixture of sp^3 and sp^2 bonds between atoms of the carbon (see page 337, paragraph 2). As one of ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to modify the bit disclosed by Scott to have the diamond like coating be carbon with a mixture of sp^3 and sp^2 bonds between atoms of the carbon as taught by Pierson.

Referring to claims 7, Scott, as modified, discloses the bit of claim 1 but does not specifically disclose the diamond like coating is amorphous and hydrogenated amorphous carbon. Pierson teaches that one property of diamond like coatings is that it is amorphous and hydrogenated amorphous carbon (see page 339-340, headings 2.4 and 2.5). As one of ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to modify the bit disclosed by Scott to have the diamond like coating be amorphous and hydrogenated amorphous carbon as taught by Pierson.

3. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Scott (6,062,070) in view of Griffin (6592985) as applied to claim 1 and further in view of Lemelson (5,794,801).

Referring to claims 8, Scott, as modified, discloses the bit of claim 1 but does not specifically disclose the diamond like coating is doped with an alloying element from the grouping consisting essentially of silicon, boron and boron nitride and a refractory metallic element from the group consisting essentially of tantalum, titanium, tungsten, niobium and zirconium. Lemelson teaches that diamond like coatings can be doped with boron, silicon, tungsten, and titanium. As one of ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to further modify the bit disclosed by Scott to have the diamond like coating be doped with boron, silicon, tungsten, titanium as taught by Lemelson.

4. Claims 1,9, and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCallum 3,720,274 in view of Nishiyama 2001/0042644 and International Patent WO9954520 to Lintula et al.

Referring to claims 1,9, 14 and 15, McCallum discloses (fig. 2) an earth-boring bit, comprising a bit body (38); a cantilevered bearing pin (38) depending from the bit body, the bearing pin having a thrust shoulder that is in a plane perpendicular to the axis of the bearing pin; a cone (42) mounted for rotation on the bearing pin, the cone having a thrust shoulder facing toward the thrust shoulder of the bearing pin; and a thrust washer (54) made of a steel alloy located between and in engagement with the thrust shoulders of the bearing pin and the cone. McCallum does not disclose the thrust washer has a diamond like coating. Nishiyama teaches putting a diamond like coating

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on both sides of a thrust washer (see col. 7, lines 58-62 and col. 9, lines 36-41).

Nishiyama teaches this coating helps improve wear resistance and thus increase service life of a bearing (see Table 2). Lintula teaches that diamond like coating can be applied to steel alloys to improve wear resistance (page 10, lines 3-9). As it would be advantageous to improve service life of the thrust washer it would be obvious to one of ordinary skill in the art at the time of the invention to modify the bit disclosed by McCallum to have the diamond like coating as taught by Nishiyama and Lintula.

5. Claims 1,10,11, and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dill et al. 3,842,921 in view of Murdoch 4,074,922, Nishiyama 2001/0042644 and International Patent WO9954520 to Lintula et al.

Referring to claims 1,10,11, 21 and 22, Dill discloses an earth-boring bit, comprising a bit body (17); a cantilevered bearing pin (35) depending from the bit body, the bearing pin; a cone (21) mounted for rotation on the bearing pin, an a single sleeve (47) located between the bearing pin and the cone and a thrust washer (41). Dill does not disclose what material the sleeve or thrust washer are made of nor a coating.

Murdoch teaches steel alloy is a material that has good wear resistance properties (col. 1, lines 53-54 and 66-68) to stand up to drilling conditions. Nishiyama teaches putting a diamond like coating on both sides of a sleeve (see col. 7, lines 58-62 and col. 9, lines 36-41). Nishiyama teaches this coating helps improve wear resistance and thus increase service life of a bearing (see Table 2). Lintula teaches that diamond like coating can be applied to steel alloys to improve wear resistance (page 10, lines 3-9).

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As it would be advantageous to improve service life of the thrust washer it would be obvious to one of ordinary skill in the art at the time of the invention to modify the bit disclosed by Dill to have the bearing be steel alloy with a the diamond like coating as taught by Murdoch, Nishiyama and Lintula.

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over McCallum 3,720,274 in view of Nishiyama 2001/004264414 and International Patent WO9954520 to Lintula et al. as applied to claim 14 and further in view of the Applicant's Admitted prior art.

McCallum, as modified, disclosed the bit of claim 14 but does not disclose the thrust shoulder contains an inlay of hard wear resistant material. The Applicant admits on page 2, lines 19-20, it is well known in the art to apply hard wear resistant material on the thrust shoulder. As one of ordinary skill in the art would be familiar with applying a hard wear resistant material on the thrust should of a bearing pin, it would be obvious to one of ordinary skill in the art to further modify the bit disclose by McCallum to have an inlay of hard wear resistant material as taught by the Applicant's Admitted Prior Art.

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over McCallum 3,720,274 in view of Nishiyama 2001/004264414 and International Patent WO9954520 to Lintula et al as applied to claim 14 and further in view Garner ('203) and Griffin ('985).

McCallum, as modified, disclosed the bit of claim 14 but does not disclose the thrust shoulder contains a diamond like coating but does not disclose the thrust shoulder contains a diamond like coating. Garner teaches applying a coating to a thrust shoulder helps to improve wear resistance (see Fig. 4, and col. 2, lines 12-30). Griffin teaches that it is well known in the art to use a diamond like coating to on bearing surfaces to improve wear resistance (see col. 3, lines 40-46). As it would be advantageous to improve the wear resistance of the thrust shoulder and diamond like coatings are well known in the art, it would be obvious to further modify the tool disclosed by McCallum to have a coating on the bearing pin and the cavity of the cone as taught by Garner and to use diamond like coating as taught by Griffin.

8. Claims 18-19 rejected under 35 U.S.C. 103(a) as being unpatentable over McCallum 3,720,274 in view of Nishiyama 2001/004264414 and International Patent WO9954520 to Lintula et al. as applied to claim 14 Handbook of Carbon, Graphite, Diamond and Fullerenes, by Pierson.

McCallum, as modified, discloses the bit of claim 14 but does not specifically discloses the diamond like coating is of carbon with a mixture of sp^3 and sp^2 bonds between atoms of the carbon. Pierson teaches that one property of diamond like coatings is that they are carbon with a mixture of sp^3 and sp^2 bonds between atoms of the carbon (see page 337, paragraph 2). As one of ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to further modify the bit disclosed by

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McCallum to have the diamond like coating be carbon with a mixture of sp^3 and sp^2 bonds between atoms of the carbon as taught by Pierson.

Referring to claim 19, McCallum, as modified, discloses the bit of claim 14 but does not specifically disclose the diamond like coating is amorphous and hydrogenated amorphous carbon. Pierson teaches that one property of diamond like coatings is that it is amorphous and hydrogenated amorphous carbon (see page 339-340, headings 2.4 and 2.5). As one of ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to further modify the bit disclosed by McCallum to have the diamond like coating be amorphous and hydrogenated amorphous carbon as taught by Pierson.

9. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over McCallum 3,720,274 in view of Nishiyama 2001/004264414 and International Patent WO9954520 to Lintula et al. as applied to claim 14, further in view of Lemelson (5,794,801).

McCallum, as modified, discloses the bit of claim 14 but does not specifically disclose the diamond like coating is doped with an alloying element from the grouping consisting essentially of silicon, boron and boron nitride and a refractory metallic element from the group consisting essentially of tantalum, titanium, tungsten, niobium and zirconium. Lemelson teaches that it is well known that diamond like coatings can be doped with boron, silicon, tungsten, and titanium (col. 2, lines 26-46). As one of

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ordinary skill in the art would be familiar with the properties of diamond like coating in order to properly apply it, it would be obvious to one of ordinary skill in the art to modify the bit disclosed by McCallum to have the diamond like coating be doped with boron, silicon, tungsten, titanium as taught by Lemelson.

10. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dill et al. '921, in view of Murdoch '922, Nishiyama 2001/004264414 and International Patent WO9954520 to Lintula et al. as applied to claim 21 and further in view of the Applicant's Admitted prior art.

Dill, as modified, disclosed the bit of claim 21 but does not disclose the thrust shoulder contains an inlay of hard wear resistant material. The Applicant admits on page 2, lines 19-20, it is well known in the art to apply hard wear resistant material on the thrust shoulder. As one of ordinary skill in the art would be familiar with applying a hard wear resistant material on the thrust should of a bearing pin, it would be obvious to one of ordinary skill in the art to further modify the bit disclose by Murdoch to have an inlay of hard wear resistant material as taught by the Applicant's Admitted Prior Art.

11. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dill et al. '921, in view Murdoch '922, Nishiyama 2001/004264414 and International Patent WO9954520 to Lintula et al. as applied to claim 21 and further in view Garner ('203) and Griffin ('985).

Dill, as modified, disclosed the bit of claim 21 but does not disclose the thrust shoulder contains a diamond like coating but does not disclose the thrust shoulder contains a diamond like coating. Garner teaches applying a coating to a thrust shoulder helps to improve wear resistance (see Fig. 4, and col. 2, lines 12-30). Griffin teaches that it is well known in the art to use a diamond like coating to on bearing surfaces to improve wear resistance (see col. 3, lines 40-46). As it would be advantageous to improve the wear resistance of the thrust shoulder and diamond like coatings are well known in the art, it would be obvious to further modify the tool disclosed by Murdoch to have a coating on the bearing pin and the cavity of the cone as taught by Garner and to use diamond like coating as taught by Griffin.

Response to Arguments

12. Applicant's arguments filed 8/19/05 have been fully considered but they are not persuasive. Referring to the arguments concerning the Scott reference, the specification does not give any special definition for coating. As broadly claimed a coating is any outer layer applied to a substance. Furthermore, the applicant does not specifically state how the coating is applied.

Referring to the arguments concerning the Griffin, reference, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of

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ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Griffin teaches that when applying coatings for wear resistance, diamond like coatings and diamond coatings are art recognized equivalents (col. 3, lines 47-49).

Referring to the arguments concerning the Nishiyama reference, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Nishiyama teaches it is known in the art to apply a diamond like coatings to thrust washer and sleeves to improve wear resistance (see Table 2).

Referring to the arguments concerning Lemelson, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Lemelson it the coating art doping diamond like coating with boron, silicon, tungsten, and titanium is well known (col. 2, lines 26-46).

Applicant's arguments with respect to claims 10,11 and 21-24 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Giovanna M. Collins whose telephone number is 571-272-7027. The examiner can normally be reached on 6:30-3 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David J. Bagnell can be reached on 571-272-6999. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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